

WHAT IS CLAIMED IS:

1. An exposure method of forming patterns of a plurality of layers on a substrate using a plurality of exposure apparatus, comprising:

- 5 adjusting an image forming characteristic of a first exposure apparatus in said plurality of exposure apparatus to expose one layer in consideration of image distortion correction capability of a second exposure apparatus which is different from said first exposure apparatus; and
- 10 exposing another layer by using said second exposure apparatus.

2. The exposure method according to Claim 1, wherein said first apparatus is one of a stationary type exposure apparatus
- 15 in which a mask and said substrate are almost stationary during exposure and a scanning type exposure apparatus in which a mask and said substrate are synchronously moved during exposure, and said second apparatus is the other of the stationary type exposure apparatus and the scanning type
- 20 exposure apparatus.

3. The exposure method according to Claim 2, further comprising:

- 25 adjusting an image forming characteristic of the second exposure apparatus in consideration of image distortion correction capability of said first exposure apparatus.

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4. The exposure method according to Claim 1, wherein said first apparatus and said second apparatus are used in said exposure of layers in sequence.

5 5. The exposure method according to Claim 4, wherein said first apparatus includes one of a stationary type exposure apparatus in which a mask and said substrate are almost stationary during exposure and a scanning type exposure apparatus in which a mask and said substrate are synchronously moved during exposure, and said second apparatus includes the other of the stationary type exposure apparatus and the scanning type exposure apparatus.

10 6. An exposure method of transferring a pattern of a second mask onto a substrate using a second exposure apparatus after transferring a pattern of a first mask onto said substrate using a first exposure apparatus, the method comprising:

15 adjusting an image forming characteristic of said second exposure apparatus, in consideration of an image distortion which is difficult or impossible to be corrected by said first exposure apparatus; and

20 exposing said substrate to transfer the pattern of said second mask by using said second exposure apparatus.

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7. An exposure method of transferring a pattern of a first mask onto a substrate using a first exposure apparatus before

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transferring a pattern of a second mask onto said substrate using a second exposure apparatus, the method comprising:

adjusting an image forming characteristic of said first exposure apparatus, in consideration of an image distortion
5 which is difficult or impossible to be corrected by said second exposure apparatus; and

exposing said substrate to transfer the pattern of said first mask by using said first exposure apparatus.

10 8. The exposure method according to Claim 7, wherein said second exposure apparatus is a scanning type exposure apparatus which moves said mask and said substrate synchronously during exposure, and

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15 said image forming characteristic of said first exposure apparatus is adjusted so as to reduce an axially symmetrical image distortion component which is difficult or impossible to be corrected by said scanning type exposure apparatus.

20 9. The exposure method according to Claim 7, wherein said second exposure apparatus is a stationary type exposure apparatus in which said mask and said substrate are almost stationary during exposure, and

25 said image forming characteristic of said first exposure apparatus is adjusted so as to reduce an image distortion including a rectangular component and parallelogrammatic component, which is difficult or impossible to be corrected by said stationary type exposure apparatus.

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10. An exposure method of transferring a pattern of a first mask onto a substrate using a first exposure apparatus, and of further transferring a pattern of a second mask onto said substrate using a second exposure apparatus, said method comprising:

adjusting an image forming characteristic of said first exposure apparatus, in accordance with information on an image distortion correction capability of said second exposure apparatus; and

transferring said pattern of said first mask onto said substrate.

11. The exposure method according to Claim 10, wherein said image forming characteristic of said first exposure apparatus is adjusted so as to reduce an image distortion which is difficult or impossible to be correct by said second exposure apparatus.

12. An exposure method of transferring a pattern of a first mask onto a substrate using a first exposure apparatus, and of further transferring a pattern of a second mask onto said substrate using a second exposure apparatus, said method comprising:

adjusting an image forming characteristic of said first exposure apparatus so as to leave an image distortion, which said second exposure apparatus can correct; and

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transferring said pattern of said first mask onto said substrate.

13. The exposure method according to Claim 12, wherein
5 said second exposure apparatus is a scanning type exposure apparatus which moves said mask and said substrate synchronously during exposure, and

said image forming characteristic of said first exposure apparatus is adjusted so as to leave at least one of image
10 distortion components of a rectangular component and a parallelogrammatic component, which can be corrected by said scanning type exposure apparatus.

14. The exposure method according to Claim 12, wherein
15 said second exposure apparatus is a stationary type exposure apparatus in which said mask and said substrate are almost stationary during exposure, and

said image forming characteristic of said first exposure apparatus is adjusted so as to leave at least one of image
20 distortion components of a trapezoidal component and an axially symmetrical component, which can be corrected by said stationary type exposure apparatus.

Sub av 15. An exposure method of forming patterns of a plurality
25 of layers on a substrate using a plurality of exposure apparatus, comprising:

transferring a pattern of a first mask onto said substrate

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using a first exposure apparatus;

adjusting an image forming characteristic of a second exposure apparatus, in accordance with information about image distortion correction capability of said first exposure apparatus; and

further transferring a pattern of a second mask onto an area on said substrate where said pattern of said first mask is formed, using said second exposure apparatus of which said image forming characteristic has already been adjusted.

16. The exposure method according to Claim 15, wherein said adjusting image forming characteristic of said second exposure apparatus is performed, further in consideration of information on a shape of a shot area on said substrate, said shape being measured prior to exposure.

17. The exposure method according to Claim 15, wherein said transferring said pattern of said first mask is performed in a manner that said pattern of said first mask is transferred onto said substrate with an adjustment of an image forming characteristic of said first exposure apparatus in accordance with image distortion correction capability of said second exposure apparatus.

18. The exposure method according to Claim 15, wherein transferring a pattern of a first mask is performed in a manner that said pattern of said first mask is transferred with a

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correction of an image distortion component which is difficult or impossible to be corrected by said second exposure apparatus.

5 19. The exposure method according to Claim 15, wherein one of said first and second exposure apparatus is a stationary type exposure apparatus in which said mask and said substrate are almost stationary during exposure, and

10 the other of said first and second exposure apparatus is a scanning type exposure apparatus in which said mask and said substrate are moved synchronously during exposure.

20. The exposure method according to Claim 19, wherein each of said first and second exposure apparatus respectively
 C/ 15 correct image distortion component which can be corrected.

21. The exposure method according to Claim 20, wherein said image distortion component which can be corrected includes

20 at least one of a rectangular component and a parallelogrammatic component in said scanning type exposure apparatus, and

at least one of a trapezoidal component and an axially symmetrical image distortion component in said stationary
 25 type exposure apparatus.

22. The exposure method according to Claim 19, wherein

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said one exposure apparatus of said first and second exposure apparatus roughly corrects an image distortion component which can be corrected by said other exposure apparatus, and

5 said one exposure apparatus of said first and second exposure apparatus finely corrects an image distortion component which is difficult or impossible to be corrected by said other exposure apparatus.

10 23. The exposure method according to Claim 22, wherein said stationary type exposure apparatus roughly corrects at least one image distortion component of a rectangular component and parallelogrammatic component, and finely corrects

15 at least one image distortion component of a trapezoidal component and an axially symmetrical image distortion component.

20 24. The exposure method according to Claim 21, wherein said axially symmetrical image distortion component is corrected by said stationary type exposure apparatus, in consideration of a change in said second mask by illumination.

25 25. The exposure method according to Claim 23, wherein said axially symmetrical image distortion component is corrected by said stationary type exposure apparatus, in consideration of a change in said second mask by illumination.

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26. A lithographic system of forming patterns of a plurality of layers on a substrate using a plurality of exposure apparatus, comprising:

- 5 adjusting an image forming characteristic of a first exposure apparatus in said plurality of exposure apparatus to expose one layer, in accordance with information on image distortion correction capability of a second exposure apparatus which is different from said first exposure
- 10 apparatus; and
- exposing another layer by using said second exposure apparatus.

27. The lithographic system according to Claim 26, wherein said second exposure apparatus include at least one of

- an exposure apparatus used in exposure for a previous layer which is exposed before exposure of said one layer by said one apparatus, and
- 20 an exposure apparatus used in exposure for a subsequent layer which is exposed after exposure of said one layer by said one apparatus.

28. The lithographic system according to Claim 27, further comprising a host computer for totally controlling said plurality of exposure apparatus, wherein

 said host computer provides said first exposure apparatus

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with correction instructions on an optimum image forming characteristic which has been calculated in accordance with an image distortion characteristic of said second exposure apparatus.

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29. The lithographic system according to Claim 28, wherein

one of said first exposure apparatus and said second exposure apparatus is a stationary type exposure apparatus
10 in which a mask and said substrate are almost stationary during exposure, and

the other of said first exposure apparatus and said second exposure apparatus is a scanning type exposure apparatus in which a mask and said substrate are moved synchronously during
15 exposure.

30. A lithographic system of forming patterns of a plurality of layers on a substrate using a plurality of exposure apparatus comprising:

20 a host computer for totally controlling said plurality of exposure apparatus; wherein

said host computer respectively selects an exposure apparatus to be used for each layer from said plurality of exposure apparatus in accordance with the image distortion
25 characteristics of said each exposure apparatus, and

said selected exposure apparatus adjusts its own image forming characteristic at the time of exposure in accordance

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with correction instructions from said host computer, said instructions on an optimum image forming characteristic of said selected apparatus.

5 31. A lithographic system comprising a first exposure apparatus and a second exposure apparatus, and forming patterns of a plurality of layers on a substrate using each of said exposure apparatus, wherein

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10 said first exposure apparatus adjusts its own image forming characteristic, in consideration of an image distortion correction capability of said second exposure apparatus, and

15 said second exposure apparatus adjusts its own image forming characteristic, in consideration of an image distortion correction capability of said first exposure apparatus.

32. The lithographic system according to Claim 31, wherein

20 one of said first and second exposure apparatus is a stationary type exposure apparatus in which a mask and said substrate are almost stationary during exposure, and

25 the other of said first and second exposure apparatus is a scanning type exposure apparatus in which a mask and said substrate are moved synchronously during exposure.

33. The lithographic system according to Claim 32,

wherein

each of said stationary type exposure apparatus and said scanning type exposure apparatus corrects its own image distortion component which can be corrected upon exposure.

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34. The lithographic system according to Claim 33, wherein said image distortion component which can be corrected include

at least one of a rectangular component and a
10 parallelogrammatic component in said scanning type exposure apparatus, and

at least one of a trapezoidal component and an axially symmetrical image distortion component in said stationary type exposure apparatus.

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35. The lithographic system according to Claim 32, wherein exposure is performed with each of said stationary type exposure apparatus and said scanning type exposure apparatus adjusting image forming characteristics such that

20 said one exposure apparatus of said stationary type and scanning type exposure apparatus roughly corrects an image distortion component which can be corrected by said other exposure apparatus, and

said one exposure apparatus of said stationary type and
25 scanning type exposure apparatus finely adjusts an image distortion component which is difficult or impossible to be corrected by said other apparatus.

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36. The lithographic system according to Claim 35, wherein said stationary type exposure apparatus roughly corrects

5 at least one image distortion components of a rectangular component and a parallelogrammatic component, and finely corrects

at least one image distortion component of a trapezoidal component and axially symmetrical image distortion component.
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37. An exposure apparatus which exposes a substrate with an energy beam and transfers a predetermined pattern onto said substrate, comprising:

a substrate stage for holding said substrate;
15 an optical system through which said energy beam passes;
an image forming characteristic correction mechanism for correcting a pattern image distortion which is transferred onto said substrate by said energy beam via said optical system; and

20 a controller for controlling said image forming characteristic correction mechanism in consideration of an image distortion correction capability of another exposure apparatus used in a series of lithography processes.

25 38. The exposure apparatus according to Claim 37, which further comprises a mask stage to hold a mask, said pattern formed on said mask.

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39. The exposure apparatus according to Claim 38, further comprising a driving unit which relatively scans said substrate stage holding said substrate and said mask stage holding said mask in a linear direction against said energy beam, wherein

said controller further controls at least one of a relative scanning velocity ratio and an angle between scanning directions of said substrate stage and said mask stage through said driving unit, in consideration of an image distortion correction capability of said another exposure apparatus.

40. A method of making an exposure apparatus in which an energy beam exposes a substrate and transfers a predetermined pattern onto said substrate, comprising:

providing a substrate stage for holding said substrate, providing an optical system through which said energy beam passes,

providing an image forming characteristic correction mechanism for correcting a pattern image distortion which is transferred onto said substrate by said energy beam via said optical system; and

providing a controller for controlling said image forming characteristic correction mechanism in consideration of an image distortion correction capability of another exposure apparatus used in a series of lithography processes.

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41. The method of making an exposure apparatus according to Claim 40, which further comprises providing a mask stage to hold a mask, said pattern formed on said mask.

5 42. The method of making an exposure apparatus according to Claim 41, further comprising:

providing a driving unit which scans said mask stage and said substrate stage in a linear direction against said energy beam, wherein

10 said driving unit can change at least one of a relative velocity ratio and an angle between said scanning directions of said mask stage and said substrate stage.

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43. A device manufacturing method including a
15 lithographic process, wherein

exposure is performed using the method according to Claim 1 in said lithographic process.

C/ 20 44. A device manufacturing method including a lithographic process, wherein

exposure is performed using the method according to Claim 6 in said lithographic process.

25 45. A device manufacturing method including a lithographic process, wherein

exposure is performed using the method according to Claim 7 in said lithographic process.

46. A device manufacturing method including a lithographic process, wherein

exposure is performed using the method according to Claim 10 in said lithographic process.

47. A device manufacturing method including a lithographic process, wherein

exposure is performed using the method according to Claim 12 in said lithographic process.

48. A device manufacturing method including a lithographic process, wherein

exposure is performed using the method according to Claim 15 in said lithographic process.

49. A device manufacturing method including a lithographic process, wherein

the lithographic system according to Claim 26 is used in said lithographic process.

50. A device manufacturing method including a lithographic process, wherein

the lithographic system according to Claim 30 is used in said lithographic process.

51. A device manufacturing method including a

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lithographic process, wherein

the lithographic system according to Claim 31 is used in
said lithographic process.

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